Problem Set 8 — Due February 28, 2002

Problem 1

Part A. Give the “syntax” (a something-tuple) for a two-stack, deterministic, push-down automaton (a 2S/PDA). Explain the intended meaning for your transition function.

Part B. Argue that a 2S/PDA is Turing-equivalent.

Problem 2 Classify each of the following problems as either:

— **decidable**: I see how to decide this language.
— **r.e.**: I don’t see how to decide this language, but I can see a procedure to accept this language;
— **co-r.e.**: I don’t see how to decide this language, but I can see a procedure to accept the complement of the language;
— **neither**: I don’t see how to accept this language nor its complement.

You don’t need to justify your answers (you just have to get the same answers as me!).

Part A. \{⟨M⟩ : M is a TM that accepts some string of prime length}\}.

Part B. \{⟨M⟩ : M is a C-program that halts on ⟨M⟩\}.

Part C. \{⟨G⟩ : G is a CFG and G accepts an odd-length string\}.

Part D. \{⟨M⟩ : M is a TM and M has 150 states\}.

Part E. \{⟨M⟩ : M is a TM and \(L(M) = L(M)^*\)\}.

Part F. \{⟨M⟩ : M is a TM and \(L(M) = \emptyset\)\}.

Part G. \{⟨M⟩ : M is a TM and \(L(M)\) is r.e. \}.

Part H. \{⟨G₁, G₂⟩ : G₁ and G₂ are CFGs and \(L(G₁) = L(G₂)\)\}.

Part I. \{⟨M⟩ : M is a TM and M will visit state q₂₅ when run on some input x\}.